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CONSUMPTION:

ITS

NATURE AND CURABILITY

BY THE

GERMICIDE TREATMENT.

DR. CAMPBELL.

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Ballantyne Press
BALLANTYNE AND HANSON, EDINBURGH
CHANDOS STREET, LONDON

CONSUMPTION:

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GERMICIDE TREATMENT.

BY

H. CAMPBELL, M.D.

LICENTIATE OF THE ROYAL COLLEGE OF PHYSICIANS.

BIBLIOTHECA
· MAY 1881 ·
BODLEIANA

HENRY RENSHAW,
356, STRAND, LONDON.
1881.

151. o. 559.

PREFACE.

RECENT researches into the origin and nature of consumption have completely upset old theories and done better than suggest new ones—they have established facts. Out of these facts the germicide treatment of the disease comes as a natural and logical consequence.

The following memoir is merely a brief summary of the most recent discoveries in this important field of medical research; it is hoped it may be the means of directing attention to a simple method of treatment which has already yielded such excellent results.

H. CAMPBELL.

38, QUEEN ANNE STREET,
CAVENDISH SQUARE.

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CHAPTER I.

PHTHISIS, A PARASITIC DISEASE.

The parasitic nature of tubercle.

If two vessels be partly filled with a solution of albumen, a nutritive fluid of the same nature as would be yielded by the living tissues, and into one of these a minute portion of fresh tubercular matter, so small as to be scarcely visible to the naked eye, be added, the solution so treated will shortly after become turbid, and closer examination will discover within it a number of micro-organisms in very active existence, while the other solution will remain unchanged.

Propagation of the micro-organisms.

One drop of the infected solution added to the other one, will produce the same changes in it in a short time; and successive solutions, if treated in the same manner, will each in its turn become similarly infected. This experiment proves not only the organic nature of tubercle, but its almost illimitable power of reproducing these micro-organisms.

Effects of inoculation.

The practical value of this discovery has been shown by the recent researches of Dr. Max Schüller, who has proved, by actual practice, that animals into whose tissues small quantities of these infected solutions are injected die, without exception, with all the marked symptoms of consumption, emaciation, lowered temperature, extreme exhaustion, and general deposits of miliary tubercle.

The juices from the raw muscles of animals labouring under tubercular disease, will produce it by inoculation in healthy animals, which leads to the conclusion that the micro-organisms already described find their way into all the tissues and infect them.

Pulch's experiments.

The milk from a tuberculous cow is capable of conveying the disease to healthy individuals fed with it. M. Pulch fed two sucking-pigs and two rabbits with this milk; when killed, the animals showed unmistakable tuberculous disease, in strict proportion to the length of time the milk had been administered.* These experiments have been repeated by others with identical results.

Effect of swallowing tuberculous matter.

The expectoration from a tuberculous lung will produce tubercle in the individual into whose system it may be introduced. In the *British Medical Journal* of May 22nd, 1880, a case is given where a dog, in the habit of lapping up the expectoration of a man dying of consumption, took the disease and died; and the post-mortem examination showed considerable tubercular deposits in the stomach, intestines, and lungs.

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* *Vide British Medical Journal,* July 31, 1880.

Experiments by Chaveau and others.

Chaveau and others have infected rabbits by feeding them on tubercular matter. In Munich animals were infected by the inhalation of tubercular matter in spray; and the quantity of the virus employed was a matter of indifference, as far as results were concerned, minute portions being fully as effective as large ones.

Cohnheim's experiments.

The process of infection can be actually seen in the experiment of Dr. Cohnheim, of Leipsic, who introduced a minute portion of tubercular matter into the anterior chamber of the eyes of rabbits and guinea-pigs. The irritation produced by the act of insertion soon passed off, the small portion introduced became smaller and smaller by degrees, and often completely disappeared; then for a time the eye was completely clear, until suddenly a number of small grey nodules appeared in the iris, which grew to a certain size and then changed into the cheesy tubercular matter, exactly as occurs in the human lung. In the rabbit this generally occurred about the 21st day after the inoculation, and in the guinea-pig about a week earlier. The cheesy matter, passing from the eye into the blood, deposited fresh tubercle in the lungs and other organs of the animals.

Direct contagion of tubercle.

That tubercle will infect the portion of the system in which it is first deposited, multiply and spread to other organs, beginning with those which are in direct communication with it, and later on, extending to more distant parts, these experiments abundantly prove.

Why the lungs are usually first infected.

The frequency with which the lungs are first affected, in a greater degree than other organs, may be accounted for by the presence in the atmosphere of these micro-organisms in the germ or latent state, which being breathed by individuals susceptible of their influence, settle on the tissues most favourable to their further development. This view is borne out in some measure by the fact that, in most cases of pulmonary consumption, the lymphatic glands in the trachea and bronchial tubes, are usually affected with the disease, before the lung tissue is much invaded.

Phthisis communicable without inoculation.

The direct communication from one individual to another of phthisis, without inoculation and without the intervention of any other medium than the atmosphere, has been fully established by careful observation. Many cases are on record where persons in excellent health, and without hereditary taint, have become phthisical from constant intercourse with a phthisical wife, husband or friend. Almost every person in this country, whose attention has been brought to bear on the subject, can call to mind some such event, within their own or some friend's knowledge.

Cases of direct communication of phthisis.

Dr. C. L. Bryhn, whose observations extend over a period of thirty years, relates various instances of the infectious nature of phthisis. A phthisical man married a healthy young woman; he died and she became phthisical and died; her sister who lived in the same house became phthisical; this sister married a man in perfect health, and of sound family; he, too, was attacked with phthisis, so also was his sister's daughter, who resided with him for a time. One of his children died of tubercular meningitis, two had tubercles in the lungs, one escaped. The servant who attended the first man's wife, though previously healthy, took the disease, went home and died of it, having first given it to her sister; both the parents of these young women lived to a great age, and consumption was unknown in the family.*

A remarkable series of cases has been published by Dr. H. Weber confirmatory of the infectious nature of phthisis. In one instance which he relates, several wives of a consumptive husband successively fell victims to the disease.

Milk from tuberculous cows infecting children.

That many children die of tubercular

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* *Vide London Med. Record*, July 15, 1880.

disease in the abdomen (mesenteric disease) through being fed on milk from tuberculous cows, may be believed after the exments of Pulch and others.

The scrofulous lymphatic glands so frequently seen in strumous children are filled with tubercular matter, capable of producing, by inoculation, the same results as those obtained from lung and other tubercle. The introduction of these parasites into the human system, most probably comes from the same source as that which produces mesenteric disease.

Tubercle in membranes of the brain.

The tubercular meningitis of children is supposed to be produced by the inhalation, through the nostrils, of tubercular germs in the atmosphere, the direct passage being through the light and spongy bones in immediate connection with the anterior portion of the base of the brain.

In Italy innkeepers and others have been wont to levy a heavy tax for cleansing and disinfecting rooms where the consumptive patient has been; while in India such patients are considered almost as dangerous as lepers, popular opinion compelling even the washing of cups and platters that have been handled by them.*

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* *Vide The Lancet*, Nov. 6, 1880.

CHAPTER II.

PHTHISIS, AN INFECTIOUS DISEASE.

Conclusions from previous chapter.

THAT tuberculosis, the constitutional condition which produces phthisis, is an infectious disease of a parasitic nature, induced by certain micro-organisms, which invade the body and multiply in it, the experiments and facts related in the previous chapter, must lead us to conclude as fully proved.

Various means by which tuberculosis may be communicable.

That the disease may be communicated by inoculation, by ingestion of infected food, and by inhalation of the ordinary atmospheric air, when charged with the micro-organisms thrown off from the diseased lungs of an infected individual, may also be accepted as fairly proved.

Analogy between tuberculosis and trichiniasis.

Except that different tissues and more important organs are attacked, and the immediate results are milder and slower in their production, a tuberculous patient is in somewhat the same condition as one infected by trichinæ. In acute phthisis—galloping consumption—the analogy is more marked.

The atmosphere a frequent medium in communicating consumption.

In both diseases the body is full of parasites. As diseased lungs are constantly giving off air, charged with the products of putrefaction and the germs of parasites, we must look to the atmosphere as one of the most constant, as well as most potent, means of spreading the disease.

The air we breathe is full of numerous germs of low forms of animal life. Of these the principal are bacteria, the same which, in an active stage of existence, are found in the sputa of phthisis, and the putrid expectoration of some forms of chronic bronchitis.

Habits and nature of bacteria.

These germs, floating about in the atmosphere, or adhering to the walls and ceilings of apartments, although harmless in the latent state, are capable of developing into an active and highly dangerous existence, under certain constantly occurring circumstances.

The recognition of this fact, has led to the greatest improvement in the treatment of wounds, since the days of the illustrious John Hunter; especially such as are necessary to be made by the surgeon, in the course of the more important operations.

Antiseptic Surgery.

The careful surgeon now, guided by the example and experience of Professor Lister and other scientific surgeons, performs his operations on the living body in an atmosphere full of antiseptic particles. So carefully is the patient guarded, from first to last, from all risk of contact with these floating germs, that the sutures, dressings, and even the operator's hands and instruments, are submitted to an antiseptic process before commencing; while at all removals of the dressings, as the case progresses towards complete cure, the same jealous exclusion of ordinary atmospheric air is observed.

Benefits attendant on antiseptic surgery.

The immense advantages attendant on this antiseptic treatment are seen in the comparative freedom from blood poisoning, and all the other drawbacks which formerly were the rules, as they now are the exceptions, in serious operations; while the wounds themselves, freed from contact with the septic particles of the atmosphere, heal rapidly and kindly, without the profuse purulent discharges, often more formidable, in their effects on the constitution, than the loss of an important member itself.

Bacteria a constant element in putrefactive processes.

These floating germs of bacteria attach themselves to living or dead animal matter, and create those changes in it which we call putrefaction. This condition cannot exist without the presence of bacteria, as is easily proved by its arrest and destruction, in air perfectly freed from them.

Influence of bacteria on the human system.

In their influence on the human system they may be divided into two classes,—those which are associated with many specific diseases, of an almost deadly character, and those which appear to be comparatively harmless, in the production of serious internal ailments; while both are equally capable of originating and sustaining putrefactive processes.

Prolific nature and habits of bacteria.

Out of the germ state, and favourably placed for development, both varieties of bacteria are most prolific; the newly-formed germs are thrown off in immense numbers, and, floating about in the surrounding atmosphere, after the manner of their kind, avail themselves of the first opportunity, which may offer, to settle on some animal substance, fluid or semi-fluid, and, passing into the active stage of existence, multiply with a rapidity scarcely conceivable.*

Effects of bacteria on lung cavities.

When the bacteria germs settle on the surface of a previously healthy wound, they set up a suppurative action, from which large quantities of unhealthy pus are discharged. An analogous process is produced in the walls of phthisical cavities in the lungs, when the patient breathes an atmosphere charged with these germs. In chronic bronchial affections, a healthy mucous discharge from the lining of the air tubes, is changed by the same influences into an unhealthy, purulent, and often putrid expectoration, as exhausting, and often as fatal, in its consequences as phthisis itself. In gangrene of the lung, where the tissue is breaking down, and coming away in putrid masses, the same evil influences are in deadly operation.

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* *Vide* experiments, pages 9 and 10.

Gangrene of lung.

Pure air in phthisis.

The importance of pure air in the treatment of phthisis, is of peculiar significance if the inferences thus drawn are correct. A patient suffering from suppurating cavities in the lungs, is multiplying the risks attendant on the disease, by rebreathing air which has been already discharged from the unhealthy tissues; and every expiration of germ-laden air is a further vitiation of the air to be inspired, and an increased source of risk, to friends and attendants.

Country air.

A comparatively pure atmosphere may be obtained in the open air of the country; for here the bacteria germs are diffused in the immensity of space, and their settling in numbers in one locality prevented by the constantly varying currents. The so-called mountain cure, owes its success in a great measure to the absence of floating germs, the rarity of the atmosphere at great heights being unfavourable to their existence.

Necessity for purifying town air.

In town life, and more especially where the patient is unable to leave the house, the absolute necessity of air freed from these living germs becomes of the highest importance, and fortunately means exist for producing such purification.

CHAPTER III.

THE GERMICIDE TREATMENT OF PHTHISIS.

The principle of the germicide treatment.

FROM the foregoing, it will be gathered that the germicide treatment of phthisis is based on the parasitic nature of the disease, and seeks to cure it by the employment of such means as will destroy these micro-organisms and prevent their reproduction.

Ozone and its compounds the most certain destroyer of bacteria.

The most certain destroyers of these, either in the germ or active form, are ozone and such substances as contain it in a latent state; many of the acids and essential oils are of this class, but most of them are inadmissible, where the human subject is concerned, from their directly poisonous nature if inhaled. The oils of bitter almonds, eucalyptus, mustard-seed, &c., are very powerful germicides, but very great caution requires to be exercised in their employment, even when greatly diluted, as very unpleasant results may follow their absorption into the system, when drawn by inhalation, over such extensive open and absorbing surfaces as the walls of suppurating lung cavities. Women and children are peculiarly susceptible to the poisonous effects of some of these. Nausea, loss of appetite, stomach derangements, noises in the head, and disturbances of vision, frequently follow their employment; while in rarer instances severe collapse has occurred.

Objections to some powerful germicides.

Objections to benzoate of soda.

Solution of benzoate of soda has been very largely employed in Germany, but with very varying results in the hands of different physicians; the enormous amount required to be consumed, and the length of time in which it is necessary to continue its use, before any beneficial results can be looked for, operating materially against its employment. As one physician puts it, "in trusting to the benzoate of soda treatment, you must dedicate your life to the cure of your lungs."*

Efficient and safe germicides.

Other equally efficient and less objectionable germicides exist, which can be employed freely in purifying the air, as well as for direct application to the diseased lung structures themselves.

From what has been already stated, it will be seen that the first important step, in treating phthisis on the germicide principle, is to insure perfect freedom from all germ life in the air breathed.

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* A fair exposition of this treatment will be found in an editorial article in the *British Medical Journal*, January 3, 1880.

Management of the patient's chambers.

When a patient is confined to the house, the night and day chambers must be distinct, and each of sufficient dimensions, and sufficiently ventilated, to furnish a full supply of atmospheric air.

Average amount of air breathed in twenty-four hours.

The average quantity of air inspired in twenty-four hours is about 686,000 cubic inches; this, if pure, should be composed of one-fifth oxygen and four-fifths nitrogen. The air expired is the product of certain changes just produced, and is materially altered by contact with venous blood in the lung. The inspired air supports life and combustion, the expired would destroy both. The quantity of carbonic acid, exhaled by the lungs, varies with the capacity of the chest; a well-grown man will exhale 14,000 grs. in the

Constituents of exhaled air.

twenty-four hours, equivalent to 12 ozs. of solid charcoal.

Besides the carbonic acid, the lungs throw off a considerable amount of vapour, holding animal and other material in solution. These are all in a state of decomposition; and if this vapour be condensed, and retained in a close vessel at a high temperature, unmistakable signs of putrefaction will be apparent.

In the same expired air may also be detected, the chlorides of sodium and ammonium, uric acid, and the urates of soda and ammonia, and occasionally volatile substances taken into the stomach.

Air expired from phthisical lungs.

These remarks refer, of course, to healthy lungs; but in considering the expired air from phthisical lungs, we must reckon, in addition, the deleterious substances and germs thrown off from their suppurating surfaces, and guard the patient from rebreathing them. The first step in treatment is to secure this important result.

Ventilation and temperature of rooms.

The ventilation of the chambers should be so arranged that, while fresh air is freely admitted and impure air driven out, draughts must be avoided, and the temperature kept as equable as possible.

Purification.

To free the chamber from floating and adherent germs, a light spray of some germicide fluid, which will not stain, or in anyway injure the walls, carpets, or furniture, should be played on the ceiling, the wall-paper if any, on the floor, and through the room generally, night and morning. This should be done before the patient takes possession of the chamber, and after it is left.

How to filter air.

To filter the air introduced into the

room, a piece of light, porous, cotton fabric, with the surface, which is to be exposed to the external air, loose and woolly, should be stretched on a frame, fitting exactly to the portion of the window to be left open at the top, the exact dimensions of this opening, must bear a certain relative proportion, to the cubic contents of the chamber.

In London, and large towns generally, the cotton fabric will require to be frequently changed; persons unaccustomed to observe such things, will be surprised to find the outer surface, covered with all manner of intercepted substances, many of which, would repay careful examination under the microscope.

Inhalation of germicides.

Having purified the atmosphere and insured a constant supply of fresh-filtered air, the next and most important step in treatment is the direct application of germicides to the patient's lungs. For

Respirator.

this purpose a respirator is employed, somewhat similar in form and capacity to that which is used in the application of anæsthetics, but differing from it in some important particulars.

A small chamber is fixed in this respirator, to contain the ozone-yielding material, through which the atmospheric air must pass, before it can be breathed by the patient; an arrangement is made by which the expired air is carried away, and all risk of breathing it again, as in ordinary respirators, avoided. The acts of gentle inspiration and expiration, arrange the valves that preside over the ingress and egress of the air, in such a way that all chance of rebreathing the effete and contaminated air is avoided.

Continuous inhalation.

This instrument is light in structure, and should be worn constantly, both day and night, especially in the earlier stages of treatment. Of course it must be removed for food and the necessary ablutions.

Occasional inhalation.

In very severe and urgent cases, at the commencement of treatment, a more powerful germicide may be employed for from ten to fifteen minutes, three or four times in the day, the milder one being used in the intervals; after a few weeks the stronger inhalants can be discontinued, as the milder will be found sufficient.

Internal remedies.

Associated with the inhalation of latent ozone is the employment, internally, of such remedies as the varying symptoms of the disease indicate, combined with some volatile, ozone-yielding substance, which, being carried through the alimentary system into the blood, and passed with it to the lungs, circulates through the diseased tissues, and acts in combination with the inhaled ozone, exercising with it a direct curative influence. So that the disease may be said to be attacked on both sides—from within and without.

Hæmorrhage.

In cases of hæmorrhage from the lungs, styptic inhalants are employed, which speedily arrest the bleeding and prepare the way for restorative treatment.*

Putrid expectoration and gangrene.

In putrid expectorations from dilated bronchi,† and in gangrene of the lung, complete cures have been effected, by the continuous breathing of the more powerful varieties of ozone-yielding substances.

Cure of a case.

In one recently recorded case, which occurred in a London hospital, no improvement in the cough or difficulty of breathing, was evident for the first fourteen days of the treatment, but from that period a rapid change for the better took place, and in five weeks from commencement of inhalation, which had been persisted in night and day during the whole time, the patient was enabled to leave the hospital completely cured.*

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* *Vide Medical Times and Gazette,* Nov. 15, 1879.

† *Vide ibid.*

Case cured.

Open-air exercise useful.

When the patient is equal to it, and the season admits of it, moderate and gentle exercise in the open air may be taken with much benefit, the respirator being worn during the whole time, if the treatment has not been in operation for any length of time; but when the case is progressing favourably, and a well-marked impression has been made on the disease, as is evidenced by lessened expectoration, subsidence of cough, and absence or great modification of the other distressing symptoms, the respirator may be set aside during the out-of-door exercises, especially in the country.

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* *Vide Lancet*, April, 1880.

Danger to attendants.

When the expectoration is fœtid, as well as profuse, the danger to the attendants is considerable, and particularly so to the patient himself; as the presence of this highly infectious material may, by direct contact with healthy portions of the lung, extend the disease into them and still farther lessen the breathing capacities of the organ. Dr. Curschman, formerly of Berlin, but at present director of the General Hospital in Hamburgh, reports two very interesting and instructive cases of this condition, which he cured by inhalation alone.

Dr. Curschman's cases.

In the first case, the patient, æt. thirtynine years, had been ill for eighteen months. He was much emaciated, and although of large frame weighed only 125½ lbs.; his evening temperature was 100·6° Fahr., his pulse was 102, and the expectoration very profuse and inexpressibly offensive. In a few days after the commencement of treatment, the sputa had almost entirely lost its fœtor, within a month it was free from all odour; at the same time all the distressing symptoms passed off, the pulse and temperature became natural, his appetite improved, and his general health became re-established. When he left the hospital he had gained twenty pounds in weight.

In the second case the patient, æt. fifty-three years, had been ill for some months; his evening temperature was 102·2, pulse 112, night sweats profuse.

Auscultation revealed a cavity in the lung, which was tapped and its putrid contents drawn off. He expectorated about thirty-five ounces of most intolerably fœtid matter in the twenty-four hours. After three weeks' treatment, the sputa was quite free from smell, the fever and night sweats were gone, and when he left the hospital he had increased in weight and was in fair health.

In neither of these cases, were any of the usual internal remedies employed—no hypophosphites, no cod-liver oil.*

Dr. Raymond's cases.

M. Raymond, in *Journal de Medicine* for May of the present year (1880), relates two cases of gangrene of the lung. A man, aged sixty-nine years, had gangrene of the lung, with a cavity under the left clavicle, after an attack of pneumonia. Notable improvement was discoverable after a few days' treatment, and, later on, the cavity had entirely disappeared and the recovery was complete.

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* These cases are more fully stated in the *Medical Times and Gazette* Nov. 15, 1879.

In the second case, the patient had been operated on previously for cancer of the tongue; the gangrene was extensive, but yielded to the same treatment, and the patient was cured.

In each case the internal treatment and the inhalations were combined.*

The Author's cases.

CASE 5.—A young married lady, aged twenty-three years, with an extensive cavity in the left lung, and suffering from severe cough, profuse expectoration and night sweats, with a temperature in the evening of 102° Fahr., and a pulse averaging 108, was placed under the germicide treatment; after fourteen days the cough and expectoration were materially lessened, and from that time till the expiration of the treatment, which extended over three months, all the symptoms gradually subsided, she gained flesh and strength, her temperature and pulse fell to a natural standard—she, in fact, was cured.

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* These cases will be found in the *Medical Record* for June, 1880.

In this case, on account of the extensive suppurating surface, in the lung cavity, a powerful germicide was inhaled four times daily, for fifteen minutes each time, during the first fortnight, in addition to the respirator; after that time it was not employed, as expectoration and cough had materially diminished.

The Author's cases.

CASE 6.—A single lady, aged fifty-four years, who had lost a sister from consumption, about a year before coming under the germicide treatment, was herself in a somewhat advanced stage of the disease; the expectoration was copious and offensive, cough very harassing, night sweats and hectic severe, emaciation considerable. Well-marked improvement, began very shortly after commencing treatment, and went steadily on during the course, which was continued for about three months, when she was quite recovered.

The Author's cases.

CASE 7.—A young lady, teacher in a school, who had lost two brothers from consumption, and had been unable to attend to her school duties, for upwards of a year, on account of the same disease, was placed under the germicide treatment.

Before commencing, she had all the usual symptoms of far advanced pulmonary

The Author's cases.

disease, high temperature, increased in the evening, hectic fever, troublesome cough, profuse expectoration and night sweats, and was so emaciated and exhausted she was unable to leave her bed. Within ten days from commencement, the cough and expectoration were almost entirely gone; a few days later she was able, with a little assistance, to remove into another chamber and sit up for a few hours daily; in six weeks she was comparatively well, but the treatment was continued for another month, when there appeared no further necessity for it.

In this case the lighter germicides only were employed, as inhalation of the stronger produced headache, of which the patient complained much, in fact more than appeared to be warranted, by the amount of her discomfort.

The Author's cases.

Case 8.—A young lady, aged eighteen years, of a rather hysterical temperament, with cough and severe purulent expectoration, loss of appetite, emaciation, hectic and night sweats, was treated for ten weeks, and completely restored.

This patient commenced treatment under protest, having no confidence in it, and expressing her belief that all she required was strengthening medicine, which, by the way, she had been taking for months previously. There was much difficulty, at first, in prevailing on her to use the respirator regularly, but after a few days she became more reconciled, and, as the benefit of the treatment became manifest to her, by the lessening of all her ailments, she settled down to steady and regular treatment, and eventually was quite restored.

The Author's cases.

Case 9.—A young gentleman, intended for the Church, but unable to pursue his studies at Oxford, in consequence of the condition of his chest, commenced the germicide treatment, at his parents' house in the country. I had no means of ascertaining the condition of his chest, but he reported himself as suffering from evening fever, night sweats, constant cough, and much expectoration of a very unpleasant character. He continued the treatment for ten weeks, and reported that all his chest and other symptoms had left him for more than a fortnight before he relinquished treatment.

Case 10.—A lady, fifty-four years of age, with constant cough, much purulent expectoration, great emaciation, and all the usual symptoms of advanced phthisis,

The Author's cases.

lost all these, and was fully restored to good health, after a course of treatment, extending over ten weeks.

CASE 11.—A gentleman, aged thirty-five, who had suffered occasionally, for some years, from spitting of blood and other chest symptoms, for which he had made a voyage to Australia without permanent benefit, was placed under the germicide treatment; before commencing, his symptoms were of the usual kind in advanced pulmonary consumption. He recovered sufficiently in six weeks to undertake a somewhat lengthened journey, without difficulty or much fatigue, and after a further treatment of six weeks, wrote from the country to say that all his symptoms had passed away, and he was quite himself again.

The Author's cases.

Case 12. — A young woman, aged twenty-five years, in broken health for two years past, and for some months unable to leave her bed, or even sit up in it, on account of excessive prostration, was placed under the germicide treatment. Before commencing, her condition was as follows:—great emaciation, incessant cough, with profuse purulent expectoration, total absence of appetite, burning heat of body, hectic fever towards night, night sweats, sleeplessness, dulness of mind, and apparent indifference to everything and everyone about her. There was much difficulty in getting her to wear the respirator, or to inhale; she complained of inability to draw her breath, and said the effort exhausted her. She was prevailed upon after a time to persevere, and her mother's report of her rapid improvement

The Author's cases.

reads almost like the miraculous cures in a quack advertisement. A fortnight's steady treatment, reduced the expectoration to little more than a slight mucous discharge on coughing, and this only in the morning, as the accumulation of the night; the heat of body and fever were gone, no night sweats, excellent nights of calm and gentle sleep, return of appetite, with such improvement in her strength, mental and physical, that she was able to sit up in bed and "do a little needlework," as well as chat pleasantly with her family at mealtimes, while her respirator was removed.

At the expiration of the usual period of treatment she was free from all chest disturbances and materially improved in general health, though still unfit for very active employment.

The Author's cases.

These cases, although reported in a very elementary manner, fairly illustrate what occurs during and after a full course of the germicide treatment.

Cases have occurred where, through the almost total destruction of lung tissue, and the thorough break-up of the constitution, the treatment could not be pursued with any hope of success; in such instances it was never employed, except at the earnest and repeated solicitations of the patient. No permanent benefit was effected, and, in some instances, the mere effort to inhale caused much fatigue and prostration.

All the cases, when treatment commenced, had the usual high temperature, rapid pulse, evening fever, night sweats, and copious purulent expectoration; as this last subsided, the other symptoms in the same degree became less urgent, showing a marked relation, all through the treatment, between the character and amount of the expectoration, and the constitutional disturbances.

In none of the cases were cod-liver oil and hypophosphites given, not through any objection to their employment, but merely because they did not appear to be required. If the principle on which the germicide treatment is founded be true, the necessity for mere nutrients is not indicated, so long as there are micro-organisms within the body to be destroyed.

ADDENDUM.

SINCE the foregoing pages went to press Dr. Tappeiner has published in Virchow's "Archives" the result of his recent experiments in the production of phthisis in dogs, from the inhalation of the sputa of persons suffering from that disease. These experiments are, in addition to an important series of observations published by him in 1877, and so fully bear out the remarks already made by me on this subject, I am tempted to call attention to them here.

Dr. Tappeiner's object in these later experiments was to discover if any identity existed between the pus from scrofulous glands and true tubercular matter: this question we will set aside at present, as it opens up too extensive a field of inquiry for the objects of this memoir, and follow his labours so far as they deal with tubercular matter alone.

Two dogs were made to inhale an atomized mixture of the sputa of a consumptive patient, and a certain proportion of water, for fifteen minutes daily for ten days; thirteen days later they were killed, and, on examination, nodules of tubercle were found in the lungs and spleen; these were most carefully examined under the microscope, and no doubt of their nature could be entertained.

Further investigations were made to determine the length of time from commencement of inhalation required to produce tubercle in the lungs. One dog was killed thirteen days after commencing to inhale; it had coughed for eight days and had lost three quarters of a pound in weight; no tubercle could be discovered in any of the organs. Another dog was killed on the nineteenth day after commencing inhalation, and no tubercle was found in it either.

Another dog, treated at the same time, and in the same way, was killed three months after the commencement of the inhalations, and abundant tubercles were found in the lungs and pleuræ.

On the suggestion of Professor Waldenburg, two other dogs were treated with sputa from simple chronic bronchitis, and twenty-eight days after the commencement of inhalation they were killed. The lungs of both were free from tubercle and otherwise healthy.

These experiments were made at Berlin, and the pathological results ascertained by Grawitz, Israel and Friedlander, under the supervision of Virchow, so that the facts appear to be beyond question.

The conclusions drawn by Tappeiner from these experiments are: (1) The inhalation of phthisical sputa by dogs, even in small quantities, produces with certainty tuberculosis of the lungs, with or without general tuberculosis, especially of the spleen; (2) The stage of incubation is, in dogs, longer than nineteen days, but shorter than twenty-three days.

The facts ascertained in these experiments are certainly of a very important nature. The period of incubation, however, can hardly be fixed from so small a number of experiments, since it may probably be subject to considerable variations. But these observations constitute experimental confirmation of the infection of phthisis, to which many clinical facts point, and they indicate the probable mode by which the infection is produced.[*]

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[*] Condensed from a leading article in the *Lancet* of Nov. 27, 1880.

PRINTED BY BALLANTYNE AND HANSON
LONDON AND EDINBURGH

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